CLAIMS

1. An apparatus for cooling and positioning a translating substrate during a continuous high-throughput coating deposition process comprising

a deposition chamber comprising a vacuum chamber, a gas inlet, a source of deposition material for coating the substrate, a means for delivering the deposition material from the deposition source to the surface of the substrate;

a substrate;

a means of translating a substrate to be coated through the deposition chamber; and

a means for positioning the substrate in a deposition zone where deposition material impinges upon the surface of the substrate,

wherein the substrate positioning means contains internal liquid coolant channels and internal gaseous coolant delivery channels.

2. The apparatus of claim 1 where the internal gaseous coolant delivery channels are connected by a manifold to the gas inlet and where the channels open to the deposition chamber through orifices at multiple points where the substrate assembly contacts the translating substrate.

3. The apparatus of claim 1 where the means for delivering the deposition material is an electron beam energy source.

4. The apparatus of claim 1 where the means for delivering the deposition material is an ion beam energy source.

5. The apparatus of claim 1 where the means for delivering the deposition material is a magnetron energy source.

6. The apparatus of claim 1 where the substrate positioning means is coated with the material being deposited.

7. The apparatus of claim 2 where the diameter of the gas orifices are in the range of from about 0.025 to about 0.4 inches.

8. The apparatus of claim 2 where the diameter of the gas orifices are in the range of from about 0.05 to about 0.25 inches.

9. The apparatus of claim 2 where the diameter of the gas orifices are in the range of from about 0.075 to about 0.175 inches.

10. The apparatus of claim 2 where the multiple orifices are located no more than three inches apart.

11. The apparatus of claim 2 where there the multiple orifices are positioned such that there are from one to about twelve orifices every three inches.

12. A method of cooling and positioning at least one translating substrate during a continuous high-throughput coating deposition process comprising

providing a feed spool of substrate,

unspooling and threading the substrate through a vacuum deposition chamber,

loading into the vacuum deposition chamber coating material that is to be deposited onto a surface of the substrates,

reducing the pressure in the deposition chamber to no greater than about 10^{-5} Torr,

initializing an energy source located in the deposition chamber to a pre-determined power level and trajectory,

vaporizing the surface of the coating material utilizing energy from the energy source,

feeding the substrates through a deposition zone in the vacuum chamber,

maintaining the temperature of the tape in the deposition zone at a preselected temperature by contacting the tape with a cooling and positioning means;

injecting at least one gas selected from the group consisting of inert gases and oxygen onto the substrate and into the deposition chamber through the cooling and positioning means,

allowing the vaporized coating material to impinge upon a surface of the substrates in the deposition zone for a period of time sufficient to deposit a coating of eroded coating material onto the substrates, and

collecting the coated substrates on individual take-up spools.

13. The method of claim 12 where the energy source is an electron beam energy source.

14. The method of claim 12 where the energy source is an ion beam energy source.

15. The method of claim 12 where the energy source is a magnetron energy source.

16. The method of claim 12 where the cooling and positioning means is a substrate positioning assembly containing internal liquid coolant channels and internal gaseous coolant delivery channels.

17. The method of claim 12 where the temperature at the surface of the substrate when in heat transfer relationship with the substrate positioning means is maintained at a temperature below 50 °C.

18. The method of claim 12 where the cooling and positioning means contains internal gas delivery channels connected by a manifold to a gas source and which open to the deposition chamber through nozzles at multiple points where the substrate assembly contacts the translating substrate and gas is flowed through the nozzles as the substrate translates through the deposition zone.

19. The method of claim 16 where the liquid coolant is deionized water with or without glycol or liquid nitrogen.

20. The process of claim 12 where the translation speed is in the range of from about 0.4 to about 300 meters/hour.

21. The process of claim 12 where the translation speed is in the range of from about 0.5 to about 5 meters/hour and the material being deposited is YSZ.

22. The process of claim 12 where the translation speed is in the range of from about 20 to about 300 meters/hour and the material being deposited is MgO.

23. The method of claim 12 where the gas is selected from the group consisting of N_2, Ar, He or O_2.

24. The method of claim 12 where the gas is O_2.